

CLAIMS

1. Apparatus for a combined lithographic/flexographic printing process comprising:
 - a plurality of successive printing stations for printing color images on a substrate in a continuous in-line process;
 - one of said stations printing a liquid vehicle image on said substrate with a slurry containing an encapsulated essence using the flexographic process; and
 - at least one of said successive printing stations applying an overcoating over the liquid vehicle image on the printed substrate using the offset lithographic process in said continuous in-line process.

2. Apparatus as in claim 1 wherein said overcoating is an aqueous overcoating.

3. Apparatus as in claim 1 wherein said overcoating is an ultraviolet overcoating.

4. Apparatus as in claim 1 wherein:
said substrate is a sheet; and
said continuous in-line process is a sheet-feed printing process

5. Apparatus as in claim 1 wherein:
said substrate is a web; and
said continuous in-line process is a web printing process.

6. Apparatus for a combined lithographic/flexographic printing process comprising:

a plurality of successive printing stations for printing color images on a substrate in a continuous in-line process;

one of said stations printing an aqueous-based vehicle image including a suspended metallic material therein using the flexographic process to form a metallic coating; and

at least one of the successive printing stations printing a color image over the aqueous-based vehicle image using the offset lithographic process in said continuous in-line process.

7. Apparatus as in claim 6 wherein said suspended material includes uniform-sized metal particles to form said metallic coating.

8. Apparatus as in claim 6 wherein said suspended material includes nonuniform-sized metal particles to form said metallic coating.

9. Apparatus as in claim 6 further including:
said flexographic printing station including a blanket cylinder and an impression cylinder;
a flexographic plate image on said blanket cylinder for receiving said metallic coating and transferring said metallic coating to said impression cylinder for printing said flexographic plate image on said substrate; and
an anilox roller associated with said flexographic plate for supplying said aqueous-based vehicle containing said suspended metallic material to said flexographic plate image.

10. Apparatus for creating a combined lithographic/flexographic printing process comprising:

a plurality of successive printing stations for printing color images on a substrate in a continuous in-line process;

one of said stations printing a first color image using the flexographic process; and

at least one of the successive printing stations printing a second color image over the first color image using the offset lithographic process in said continuous in-line process.

11. Apparatus as in claim 10 further including:
said flexographic process printing station including a blanket cylinder and
an impression cylinder;
a flexographic plate on said blanket cylinder and having an image for
receiving said first color and transferring said first color image to
said impression cylinder for printing on said substrate; and
an anilox roller associated with said flexographic plate for supplying said
first color to said flexographic plate image;

12. Apparatus for creating a combined lithographic/flexographic printing process comprising:

a plurality of successive printing stations for printing color images on a substrate in a continuous in-line process;

at least two successive ones of said printing stations being flexography stations and comprising:

- (1) a supply of liquid coating;
 - (2) a blanket cylinder having a flexographic plate image thereon;
 - (3) an anilox roller associated with said liquid coating and said blanket cylinder for delivering said liquid coating to said flexographic plate image;
 - (4) an impression cylinder for receiving said liquid coating transferred from said blanket cylinder flexographic plate image and printing on said substrate, said at least two flexography stations printing the same liquid coating image in sequence and in superimposed relationship;
- and

at least one offset lithographic printing station for receiving said substrate and printing over said liquid coating image.

13. Apparatus as in claim 12 wherein said liquid coating image printed on said substrate is a white color ink.

14. Apparatus as in claim 12 further including a high-velocity air dryer associated with each of said impression cylinders on said flexography stations for drying said liquid coating before the substrate is transferred to the successive printing station.

15. Apparatus for a combined lithographic/flexographic printing process comprising:

a plurality of successive printing stations for printing color images on a substrate in a continuous in-line process;

a blanket cylinder at at least a first one of said printing stations;

ink-providing means at said first one of said printing stations for applying a flexographic ink to said blanket cylinder to form an image;

a substrate for receiving said flexographic ink image transferred from said blanket cylinder; and

at least one subsequent printing station in said in-line process for receiving said image printed substrate and printing an additional colored ink image on said substrate on top of said flexographic ink image using offset lithography.

16. Apparatus as in claim 15 further comprising:
a flexographic plate image on said blanket cylinder for transferring said
flexographic ink to said substrate; and
an anilox roller for transferring said flexographic ink to said flexographic
plate image from said ink-providing means.

17. Apparatus for a combined lithographic/flexographic printing process for printing a multicolored image comprising:

a plurality of successive printing stations for printing color on a substrate in a continuous in-line process;

at least one of said printing stations having:

- (1) a blanket cylinder with a flexographic plate having an image thereon;
- (2) an etched anilox roller for applying a flexographic color ink to said flexographic plate image on said blanket cylinder;
- (3) an impression cylinder in ink-transfer relationship with said blanket cylinder for transferring said flexographic color ink image from said blanket cylinder to said substrate; and

at least one of said succeeding printing stations using offset lithography for printing additional colored ink images on top of said flexographic ink image.

18. Apparatus as in claim 17 wherein said additional colored inks are lithographic inks.

19. Apparatus as in claim 17 wherein said colored inks are waterless inks.

20. Apparatus as in claim 17 further including a high-velocity air dryer adjacent to said impression cylinder for drying the flexographic ink image transferred to said substrate before said additional colored ink images are printed thereon.

21. Apparatus as in claim 17 wherein said colored ink images are printed with halftone screening processes.

22. Apparatus as in claim 17 wherein said flexographic ink image and said colored ink images are printed in solids and/or with halftone printing plates in sequence and in registry in said successive printing stations to produce said multicolored image on said substrate.

23. Apparatus as in claim 17 wherein said printing apparatus includes a sheet-fed press.

24. Apparatus as in claim 17 wherein at least one of said flexographic printing stations prints an image with liquid vehicle slurry containing an encapsulated essence.

25. Apparatus as in claim 17 wherein at least one of said printing stations prints an image with a water-based liquid vehicle containing suspended particles.

26. Apparatus as in claim 25 wherein said suspended particles are uniform in size.

27. Apparatus as in claim 25 wherein said suspended particles are nonuniform in size.

28. Apparatus as in claim 25 wherein said suspended particles are metallic particles.

29. A method of combining lithography and flexographic printing in a continuous in-line process comprising the steps of:

providing a plurality of successive printing stations for printing colored ink images on a substrate;

printing a flexographic ink image on said substrate at at least one of said stations;

transferring said printed substrate to at least one subsequent printing station in said continuous in-line process; and

printing colored ink images on top of said flexographic ink image at at least one of said subsequent printing stations with an offset lithographic process.

30. A method as in claim 29 further comprising the step of drying said flexographic ink image on said substrate with a high-velocity air dryer prior to printing said additional colored ink images thereon.

31. A method as in claim 29 further including the step of printing a coating on top of said additional colored ink images at one of said plurality of successive printing stations.

32. A method as in claim 29 wherein said colored inks forming said colored ink images are waterless.

33. A method as in claim 29 wherein said colored inks forming said colored ink images are in a solvent based liquid vehicle.

34. A method as in claim 29 further including the steps of:
printing a slurry on said substrate at any of said printing stations in said continuous in-line process; and
printing an overcoating over said slurry at a subsequent printing station in said in-line process to protect said essence.

35. A method as in claim 34 further including the step of using an encapsulated coating over said slurry.

36. A method as in claim 34 further including the step of printing an aqueous-based coating over said slurry.

37. A method as in claim 34 further including the step of printing an ultraviolet coating over said slurry.

38. A method of combining offset lithography and flexographic printing in a continuous in-line process comprising the steps of:

applying a flexographic ink to a blanket cylinder in a pattern with a coating head at first printing station;

transferring said pattern of flexographic ink from said blanket cylinder to a substrate; and

printing a waterless ink pattern over said flexographic ink pattern on said substrate at at least one subsequent offset lithographic printing station in said continuous in-line process.

39. A method of combining lithography and flexographic printing in a continuous in-line process comprising the steps of:

printing an aqueous-based vehicle image having suspended particles therein on a substrate at a first flexographic printing station;

transferring said image printed substrate to at least one subsequent printing station in said continuous in-line process; and

printing additional colored ink images on said printed substrate over said aqueous-based vehicle image in an offset lithographic process at subsequent ones of said printing stations in said in-line process.

40. A method of combining lithography and flexographic printing in a continuous in-line process comprising the steps of:

- (1) providing a plurality of successive printing stations for printing liquid vehicle images on a substrate in said in-line continuous process;
- (2) utilizing an anilox roller to transfer a liquid ink as said liquid vehicle to a flexographic plate image at at least one of said printing stations;
- (3) printing said liquid ink from said flexographic plate image to a substrate;
- (4) transferring said printed substrate with said liquid ink image to a subsequent printing station in said in-line printing process;
- (5) repeating steps (2)-(4) at subsequent printing stations in said in-line process to achieve a desired opacity ink image on said substrate; and
- (6) printing an ink pattern over said flexographic ink image using an offset lithographic process.

41. A method as in claim 40 further including the step of additionally printing colored ink images over said liquid ink image on said substrate at subsequent ones of said printing stations in said in-line process.

42. A method as in claim 41 wherein said liquid ink is an opaque white color.